openreach

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Suppliers' Information Note

For the Openreach Network

Optical Spectrum Extended Access
Service & Interface Description

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1. Introduction

This Suppliers Information Note (SIN) describes the Openreach Optical Spectrum Extended Access (OSEA) service and its interfaces. Optical Spectrum Extended Access is an Openreach Connectivity Services product within the Optical Spectrum Services portfolio. From January 2009 until June 2010, OSEA has been available with Ciena equipment only. From June 2010 onwards, Openreach customers may select Ciena or Cisco equipment to fulfil their OSEA service.

Note: Openreach has provided formal notification that Ciena 4200 OSEA (all components) are no longer available for new supply with effect from 11 May 2016. External shifts (re-sites and re-arranges) are also not available from this date.

Openreach provided formal notification that new supply of Cisco based bearer services was withdrawn after 31 December 2013, with Openreach continuing to support upgrades to existing installations with new wavelengths until 31 March 2014. Openreach have now announced the platform closure and full withdrawal of Cisco services in March 2020.

2. Service Outline

2.1 General

Optical Spectrum Extended Access is an end-to-end wavelength service between sites delivered over Openreach provided fibre infrastructure using DWDM (Dense Wavelength Division Multiplexing) technology. Optical Spectrum Extended Access is suitable for linking end user sites, or an end user site to a CP site. Ciena OSEA is remotely monitored by Openreach.

High bandwidth connectivity of up to 10Gbit/s per DWDM wavelength is offered. Currently wavelengths of 2.5Gbit/s, 10Gbit/s or a combination of both can be supported on each OSEA bearer system depending on fibre characteristics and overall route length.

The elements of the service are:

- **OSEA Bearer**: this is the DWDM line system which can support a mix of up to 32 x 2.5Gbit/s and 10Gbit/s wavelengths. The default OSEA bearer installation is configured to support up to four wavelengths (wavelengths are ordered separately).
- **Expansion units**: these provide the capacity for additional wavelengths and end-point amplification on the OSEA bearer. Large and small expansion units are available to support the design of each OSEA system.
- **Auxiliary units**: these are used when needed on long lines to counteract the effects of Chromatic Dispersion.
- **End-point amplification**: Over longer fibre route distances additional end-point amplification maybe required to ensure the OSEA bearer system works effectively.
- **Mid-point amplification:** Mid-point amplification is typically required for fibre route distances in excess of 80-100km. This amplification is usually sited in a

suitable BT Node.

- **Wavelengths:** these are ordered separately from the bearer and are specific to the protocol and speeds required. They are installed in the OSEA bearer.

Sites can be linked in three distinct topologies: point-to-point, chain or ring.

The Ciena variant of the OSEA service is no longer limited to a maximum of 70km radial distance between BT serving exchanges. This also includes the removal of a maximum of 70km distance between adjacent points on a ring or chain configuration. However, the 70km radial distance restriction is still in place for the Cisco variant of the OSEA service. The maximum fibre route distance between OSEA bearer circuit end points is not specified, however additional amplification may be required as the fibre route distance increases.

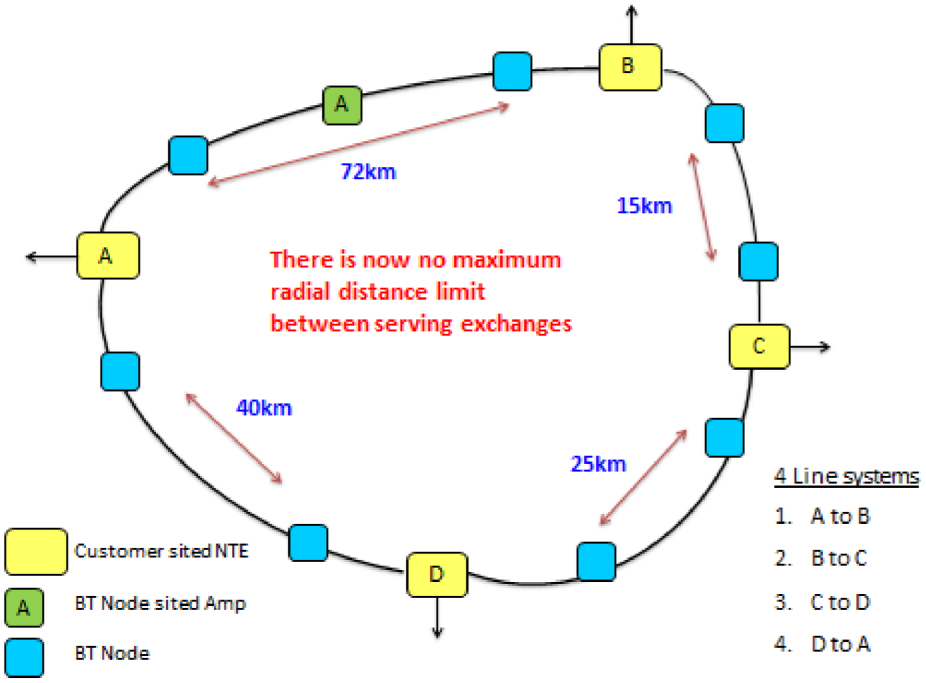

Figure 1. Ciena OSEA Ring configuration

Figure 1 shows a ring configuration, but now denotes no distance limitations between BT serving exchanges, which also apply to chain and point-to-point OSEA Ciena bearer configurations.

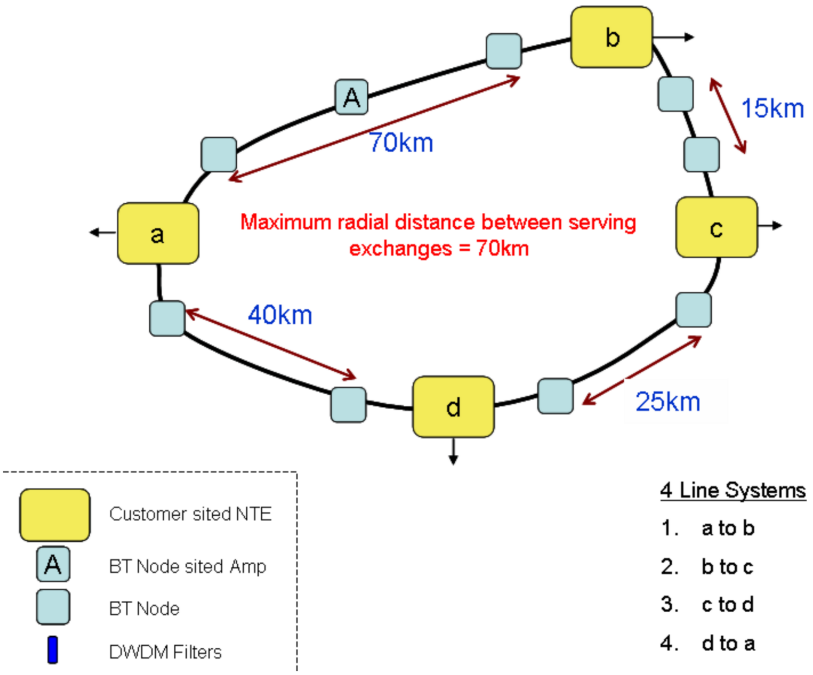

Figure 2. Cisco OSEA Ring configuration

Figure 2 shows a ring configuration, but still denotes the 70km radial distance limitations between BT serving exchanges, which also still apply to chain and point-to-point OSEA cisco bearer configurations.

2.2 NTE vendor

The Network Terminating Equipment (NTE) types currently used for Optical Spectrum Extended Access are the Ciena CN4200 and Cisco ONS 15454 systems.

Each vendor offers a choice of service interface cards, however there may be differences in the number and types of service interfaces supported. Cards are vendor specific. Please refer to the Optical Spectrum Extended Access product handbook for further information (http://www.openreach.co.uk/orpg/home/products/opticalservices/opticalspectrumextendedaccess/opticalspectrumextendedaccess.do).

2.3 Services supported

The services are available at the following interfaces:

Single Client Interface

- Fast Ethernet 100-Base-FX (Cisco only)
- SDH STM-1, STM-4 & STM-16 (Cisco only) Transparent 16mbps to 2.5Gbps (Cisco only)
- 10 Gigabit Ethernet (LAN Phy)
- 10 Gigabit Ethernet (WAN Phy) SDH STM-64
- 10G Fibre Channel

- OTU2 (Ciena only)

Multiple Client Interfaces

- 1 Gigabit Ethernet
- 1 Gigabit Fibre Channel
- 2 Gigabit Fibre Channel
- 4 Gigabit Fibre Channel
- 1 Gigabit FICON
- 2 Gigabit FICON
- 4 Gigabit FICON (Cisco only) ESCON 200Mb
- SDH STM1, 4, 16 (Ciena Only) OTU1 (Ciena only)

Optical Spectrum Extended Access services are intended for connection to standard optical interfaces of 850 nm multimode or 1310 nm single-mode/multimode types. No electrical interfaces are offered. Table 1 gives details of the optical interface/service options.

ESCON and FICON are proprietary storage area protocols from IBM and are used in many SAN customer sites. The coupling link is required if the customer is running sysplex timing on their Storage Area Network, as a special timing signal is broadcast over the network to ensure data integrity.

2.4 Circuit protection

Depending on the level of route protection required, the OSEA bearer can have either no fibre circuit protection (Standard), Resilience Option 1 or Resilience Option 2. The OSEA bearer resilience options are:

- Optical Spectrum Extended Access Standard
- Optical Spectrum Extended Access Resilience Option 1
- Optical Spectrum Extended Access Resilience Option 2

Please note that bearer Resilience Option 1 fibre protection is available on a point-to-point topology only.

Wavelength switching protection is also optionally available for certain combinations of topology and bearer resilience. Wavelength switching protection enables protected wavelengths to be automatically switched to an alternative optical path to maintain service between the same wavelength A and B ends. Wavelength switching to an alternative site is not offered. The incoming line signals are monitored and failure of this will trigger the system to switch the wavelengths within 50ms of a failure being detected. The system does not monitor the users' equipment.

Protocols with latency sensitivities (e.g. ESCON, FICON) may require customer reconfiguration following an incident resulting in a switch to the protection path. The Openreach equipment will continue to function on the protection path.

Refer to the OSEA product handbook for further information on bearer resilience options

and wavelength protection http://www.openreach.co.uk/orpg/products/oss/oss.do.

2.5 Geographical Availability

Openreach's OSEA service is offered throughout the United Kingdom subject to survey.

Single-mode (1310nm) or multi-mode (1310nm or 850nm) optical interface options are available depending on the type of wavelength card selected. Each NTE vendor offers a choice of wavelength interface cards, however there may be differences in the number and types of interfaces supported per card. Wavelength cards are vendor specific.

The customer interfaces offered are shown in Table 1. These interfaces are described in the documents listed against each interface in clause 6, References.

		Cisco		Ciena	
Service supported	Bandwidth (bit/s)	1310nm SM	850 MM	1310nm SM	850 MM
Fast Ethernet (100M)	100M	Yes	No	No	No
10 Gigabit Ethernet (LAN Phy)	10.3125G	Yes	No	Yes	No
10 Gigabit Ethernet (WAN Phy)	9.95328G	Yes	No	Yes	No
10G Fibre Channel	10.5187G	Yes	No	Yes	No
SDH STM-64	9.95328G	Yes	No	Yes	No
OTU2	10.709G	No	No	Yes	No
Gigabit Ethernet	1.25G	Yes	Yes	Yes	Yes
Fibre Channel	1.06G	Yes	Yes	Yes	Yes
2G Fibre Channel	2.125G	Yes	Yes	Yes	Yes
4G Fibre Channel	4.24G	Yes	Yes	Yes	Yes
FICON	1.06G	Yes	Yes	Yes	Yes
2G FICON	2.125G	Yes	No	Yes	No
4G FICON	4.24G	Yes	Yes	No	No
ESCON 200	200M	Yes	No	No	No
SDH STM-1	155M	Yes	No	Yes	No
SDH STM-4	622M	Yes	No	Yes	No
SDH STM-16	2.488G	Yes	No	Yes	No
OTU1	2.67G	No	No	Yes	No

Note: 850 nm MM is not available on all OSEA services.

Table 1. Interface options

2.6 Buffer crediting

The Cisco OSEA bearer equipment supports distance extension for Fibre Channel and FICON protocols with full line rate being available to a theoretical maximum route distance of 1600km at 1Gbit/s. However, in order to achieve these route distances, the attached SAN equipment must be able to support Buffer Crediting technology. With this feature enabled, a port indicates the number of frames that can be sent to it (its buffer credit), before the sender is required to stop transmitting and wait for the receipt of a "ready" indication.

The Cisco 2.5Gbit/s and 10Gbit/s cards support FC credit-based flow control with a buffer-to-buffer credit extension of up to 1600 km (994.2 miles) for 1Gbit/s FC, up to 800 km (497.1 miles) for 2Gbit/s FC and up to 400 km (248.5 miles) for 4Gbit/s FC.

The Cisco 15454 auto-senses the number of buffer credits required to provide the optimum throughput. The customer can request that the distance extension (also known as buffer credit spoofing) be either enabled or disabled. Ciena equipment does not support buffer crediting but is transparent to customer own equipment distance extension protocols.

2.7 Connector

The patch panel interface is the Network Termination Point (NTP), i.e. the point of connection between the Openreach Network Terminating Equipment (NTE) and the CPE interface. Optical interfaces are presented as SC/PC connectors as the default, LC can be offered as an alternative.

2.8 Fibre

Where a service employing a local or remote single-mode interface is provided, all fibre optic connections to and from the patch panel use single-mode fibre 9/125 micron according to ITU-T G.652[2].

Where a service employing a multimode interface is provided all fibre optic connections to and from the patch panel use multimode fibre 62.5/125 micron or 50/125 micron @ 1310nm according to ITU-T G.651[1].

2.9 Transmission

The NTE is capable of transporting data at 10 Gbit/s per wavelength on the aggregate point- to-point fibre link. Multiplexing is carried out by passive filter components that combine the light of different optical channels using different wavelengths on to a single fibre. De- multiplexing is carried out by passive filter components that break out the aggregate signal from a single fibre into optical channels.

2.10 Client Side Optics

Table 2 and Table 3 provide details of the optical power margins for both the receive and transmit interfaces of the client facing optical interfaces.

Cisco				
Protocol	Receiver Minimum	Receiver Overload	Transmit Minimum	Transmit Maximum
10GE, 10G FC, SDH STM-64	-11 dBm	-1 dBm	-6 dBm	-1 dBm
Single Mode – GE, 1G & 2G FC, 1G & 2G	-20 dBm	-3 dBm	-9.5 dBm	-3 dBm
Multi Mode - GE, 1G & 2G FC, 1G & 2G	-15 dBm	0 dBm	-10 dBm	-3.5 dBm

Table 2. Optical power margins (Cisco)

Ciena				
Protocol	Receiver Minimum	Receiver Overload	Transmit Minimum	Transmit Maximum
10G FC, SDH STM-64	-11 dBm	0.5 dBm	-6 dBm	-1 dBm
10GE	-14.5 dBm	0.5 dBm	-6 dBm	-1 dBm
OTU2	-14.5 dBm	0.5 dBm	-6 dBm	-1 dBm
STM-1/4/16	-18 dBm	0 dBm	-9.5 dBm	-3 dBm
OTU1	-18 dBm	0 dBm	-9.5 dBm	-3 dBm
Single Mode – GE, 1G & 2G FC, 1G & 2G	-20 dBm	-3 dBm	-9.5 dBm	-3 dBm
Multi Mode - GE, 1G & 2G FC, 1G & 2G	-17 dBm	-3.5 dBm	-9.5 dBm	-3 dBm

Table 3. Optical power margins (Ciena)

2.11 OTU1 and OTU2 Interface options (Ciena only)

Option	Client ports	Wavelength
1.	Non OTU client one end to OTU1 client other end	OTU1 (known as 2.5G wavelength)
2.	Non OTU client one end to OTU1 client other end	OTU2 (known as 10G wavelength)
3.	Non OTU client one end to OTU2 client other end (Note:- Non OTU client options can only be STM-64 or 10GbE WAN PHY)	OTU2(known as 10G wavelength)
4.	OTU1 client one end to OTU1 client other end	OTU1(known as 2.5G wavelength)
5.	OTU1 client one end to OTU1 client other end	OTU2(known as 10G wavelength)
6.	OTU2 client one end to OTU2 client other end	OTU2(known as 10G wavelength)

Table 4 OTU 1 and 2 interface Options

Note: Non OTU clients into an OTU1 uses a Ciena proprietary mapping and can only be de- mapped using another Ciena CN-4200 Network Element.

3. NTE Power Requirements

The NTE will require two 240 Volt AC power supply using a 13 Amp switched sockets which must be provided within 1.5 metres of the NTE chassis for each chassis provided. A 240 Volt AC power supply using a 13 Amp switched socket is also required within 1.5 metres of the Openreach remote Network Management equipment.

Cabinet Requirements	Monitoring Requirements
2 x 240-volt AC (13 Amp) within 1.5m	1 x 240-volt AC (13 Amp) within 1.5m

Table 5 AC power Requirements

2 x DC supplies should be presented into the BT cabinet DC fuse distribution panel for termination in screw type terminals. In addition to the two DC NTE power requirements above, a 50Hz AC mains supply 13amp socket should also be provided, within 1.5m of the NTEs, to power Openreach test equipment during both initial commissioning and subsequent maintenance support activities.

Cabinet Requirements	Monitoring Requirements
2 x 48 volt DC in the cabinet	1 x 240 volt AC (13 Amp) within 1.5m

Table 6 DC Power Requirements

- BT cabinet is 600mm x 600mm footprint with a height of 2.2 metres.
- OSEA also supports customer's own cabinet installations (subject to survey).
- The equipment requires 19" rack mounting practice.

For enquiries concerning connection availability between particular sites and for further product information about this service please visit the website at www.openreach.co.uk or contact your Openreach Sales & Relationship Manager or sales specialist.

If you have enquiries relating to this document, then please contact: sinet.helpdesk@bt.com.

4. References

1	ITU-T G.651	Recommendation G.651 (02/98) - Characteristics of a 50/125 µm multimode graded index optical fibre cable
2	ITU-T G.652	Recommendation G.652 (04/97) - Characteristics of a single-mode optical fibre cable
3	ESCON	IBM Proprietary as specified in IBM Red Book Standard for GDPS.
4	Fast Ethernet	IEEE 802.3
5	Fibre Channel	ANSI/NCITS X3.288-1996
6	FICON	FICON, the IBM zSeries zOS channel protocol succeeding ESCON
7	Gigabit	IEE 802.3z or SIN 360 Gigabit Ethernet for the BT Network
8	ITU-T G.957	Optical interfaces for equipment and systems relating to the synchronous digital hierarchy

For information on where to obtain these referenced documents, please see the document sources list at http://www.btplc.com/sinet/

5. Abbreviations

ATM	Asynchronous Transfer Mode
CP	Communications Provider
CPE	Customer Premises Equipment
DWDM	Dense Wavelength Division Multiplexing
ESCON	Enterprise Systems Connectivity architecture
FC/PC	Fibre Connector / Planar Convex
FICON	FIbre Connectivity
Gbit/s	Gigabits per second
IBM	International Business Machines
ITU-T	International Telecommunication Union- Telecommunications Standardization Sector
km	Kilometre
LC	Lucent Connector
LAN	Local Area Network
Mbit/s	Megabits per second
MM	MultiMode
NTE	Network Terminating Equipment
NTP	Network Terminating Point
OESA	Optical Spectrum Extended Access
SAN	Storage Area Network
SC/PC	Subscription Channel / Physical Contact

SIN	Supplier Information Note
SM	Single Mode
WDM	Wavelength Division Multiplexing

6. History

Issue	Date	Changes
Draft 1	November	First draft for comment
Draft 2	14th November	Updated following feedback from Simon Moore, Andrew Hastie, John Marney and Darren Wallington.
Draft4	21 Nov	Final draft
5.0	April 2010	Review by Chris Wythe, Simon Moore, Charif Karpoulty, Emma
6.0	April 2011	Changes made to Include OTU Interface.
7.0	July 2013	Removal of the 70km Radial distance restriction for Ciena OSEA variant.
7.1	July 2014	Change SINet site references from http://www.sinet.bt.com to http://www.btplc.com/sinet/
7.2	August 2016	Addition of note in section 1 to state that the Ciena 4200 services (all components) are no longer available for new supply as from 11 May 2016.
7.3	February 2019	Updated to reflect the withdrawal of Cisco services March 2020.
7.4	June 2020	Change SINet site references from http://www.btplc.com/sinet/ to https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do
7.5	August 2021	Annual Review – no changes required – issue remains unchanged.
7.5	August 2022	Annual Review – branding and font changes only – issue remains unchanged.
7.5	September 2023	Annual Review – branding and font changes only – issue remains unchanged.
7.5	October 2024	Annual Review – branding and font changes only – issue remains unchanged.

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